Fermilab

PPD/MD/Engineering Analysis Group

The Summary of the Result based on Criteria of Maximum Working Stress at or below 1,800 psi for PVC

Ang Lee
Oct 11, 2004

As discussed, we're trying to keep the maximum working stress at or below 1,800 psi. Therefore,

1) For the vertical extrusion subjected to 21 psi, the maximum stress is 1,956 psi as shown in Fig 1. It is very close to the 1,800 psi. It has SF=6100/1956=3.

2) For the horizontal extrusion, it is subjected to 21 psi due to the separation of the rib and the side wall in the vertical extrusion. The buckling calculation shows that for a 2 mm thickness of the rib, it has p(collapsing pressure)=90 psi as shown in Fig 2. It is more than 42 psi as a design criteria.

3) So, we've chosen the side wall=3 mm and rib= 2 mm above, then buckling and stress calculation for the horizontal extrusion will be satisfied easily as shown in Fig 3 for the lower cell buckling __ pancake mode (SF>10) and the stress under a operating condition as shown in Fig 4.

4) Fig 5 is one of possible failure mode. If one of rib in the vertical extrusion is separated from the side wall, the span length will be doubled with a same 21 psi. The maximum stress is around 5,800 psi as shown in Plot 5. It is very close to the its yield=6100 psi.

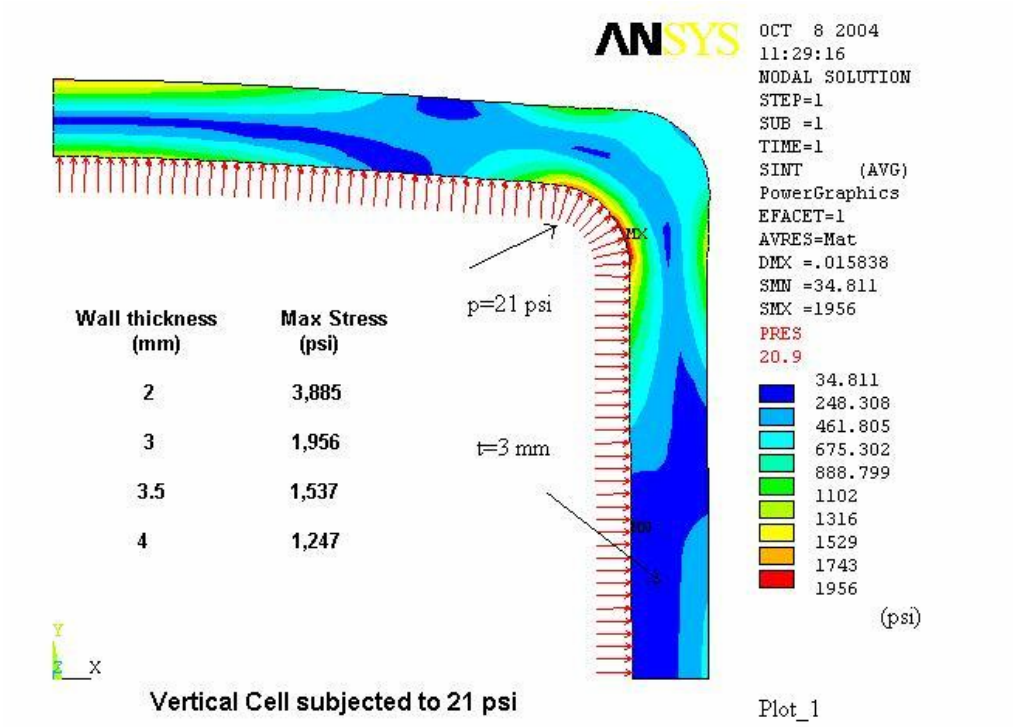

Fig 1 The vertical cell subjected to 21 psi

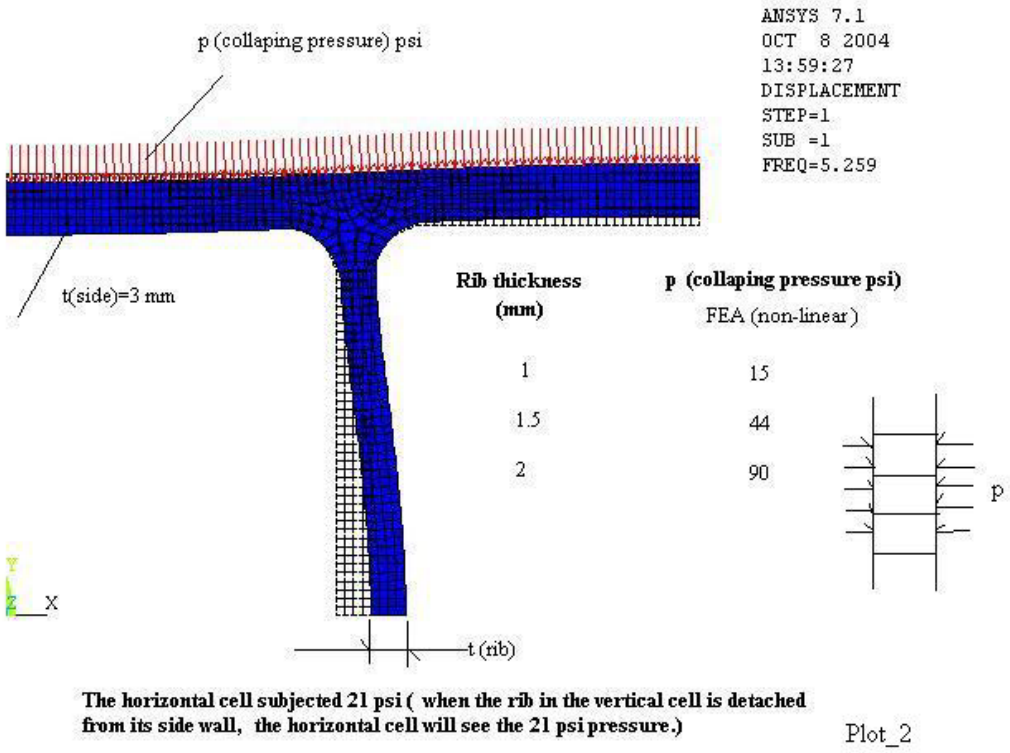

Fig 2 The horizontal cell subjected to 21 psi

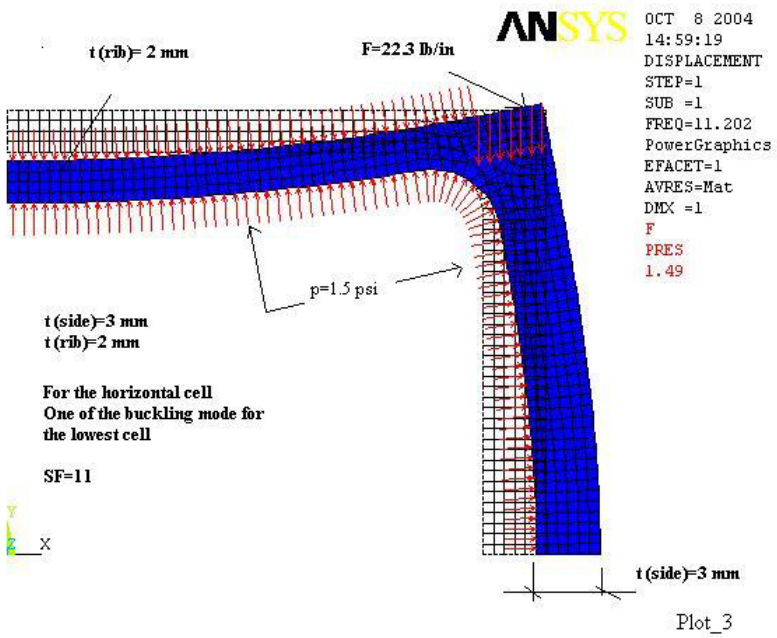

Fig 3 The lowest cell buckling mode for the horizontal extrusion

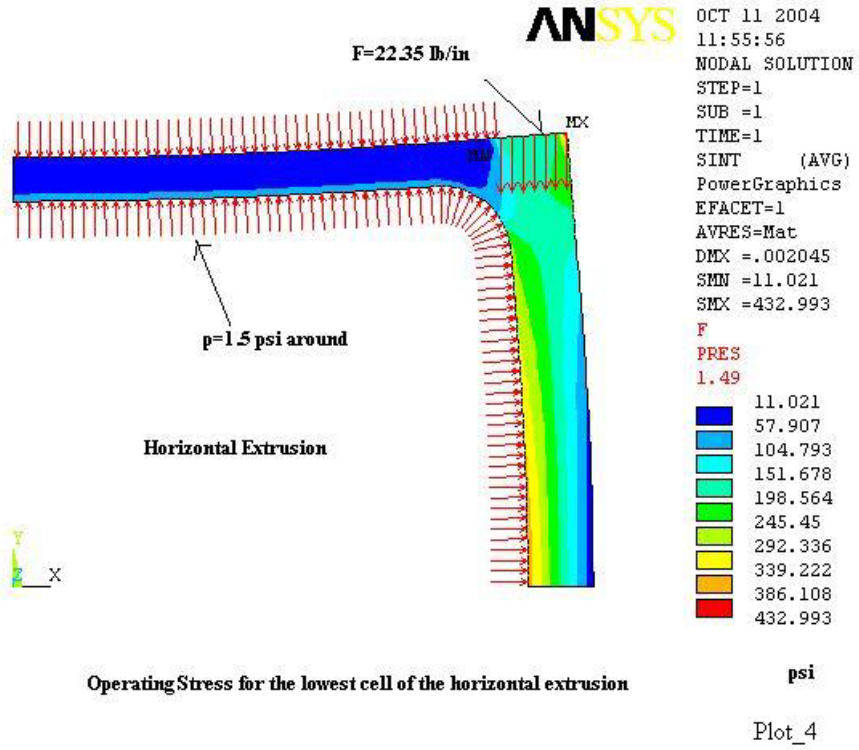

Fig 4 The operating stress for the lowest cell of the horizontal extrusion

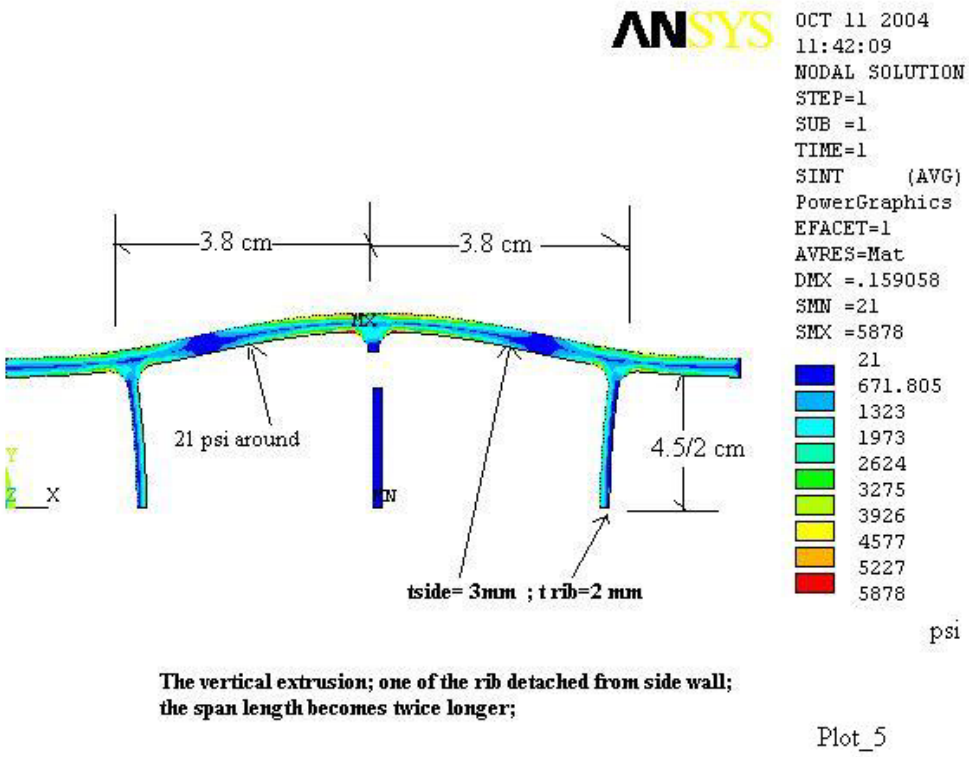

Figure 5 One of the possible failure mode for the vertical extrusion